

CLAIMS

1. A cholesteric liquid crystal driving device comprising:
a detection circuit for detecting a first scanning line
5 and a second scanning line, wherein, in image data having two
or more gray levels to be displayed by a plurality of
cholesteric liquid crystals provided at intersections of a
plurality of scanning lines and a plurality of data lines, the
orientation of each of the plurality of cholesteric liquid
10 crystals being defined in a P-orientation, an F-orientation,
or an H-orientation in accordance with a voltage between the
corresponding scanning lines and the corresponding data lines,
one part of the image data corresponding to a cholesteric
liquid crystal on the first scanning line has different gray
15 levels other than a halftone and another part of the image
data corresponding to a cholesteric liquid crystal on the
second scanning line has the same gray level other than the
halftone;

a first driving circuit for displaying, on the basis of a
20 detection result for the first scanning line by the detection
circuit, the one part of the image data to be displayed by the
cholesteric liquid crystal on the first scanning line by
driving the cholesteric liquid crystal on the first scanning
line in accordance with a first cycle including a reset period
25 for resetting the cholesteric liquid crystal in the H-
orientation, a selection period for selecting the cholesteric
liquid crystal, which is reset in the H-orientation, in a TP
orientation, and a holding period for holding the cholesteric

liquid crystal, which is selected in the TP orientation, in the F-orientation and in accordance with a second cycle including a reset period for resetting the cholesteric liquid crystal in the H-orientation, a selection period for selecting the cholesteric liquid crystal, which is reset in the H-orientation, in the H-orientation, and a holding period for holding the cholesteric liquid crystal, which is selected in the H-orientation, in the P-orientation; and

a second driving circuit for displaying, on the basis of a detection result for the second scanning line by the detection circuit, the other part of the image data to be displayed by the cholesteric liquid crystal on the second scanning line by driving the cholesteric liquid crystal on the second scanning line in accordance with a third cycle including a reset period for resetting the cholesteric liquid crystal in the H-orientation and a holding period for holding the cholesteric liquid crystal, which is reset in the H-orientation, in the F-orientation or in accordance with a fourth cycle including a reset period for resetting the cholesteric liquid crystal in the H-orientation, the cholesteric liquid crystal, which is reset in the H-orientation, being transit to the TP orientation at the end of the reset period.

2. The cholesteric liquid crystal driving device according to Claim 1, wherein:

the detection circuit detects at least one scanning line group including two or more scanning lines, each of the scanning lines corresponding to the second scanning line; and

the second driving circuit performs first synchronous driving for synchronously driving the two or more scanning lines included in the one scanning line group in accordance with the third cycle or the fourth cycle or performs first asynchronous driving for asynchronously driving the two or more scanning lines included in the one scanning line group in accordance with the third cycle or the fourth cycle.

3. The cholesteric liquid crystal driving device according to Claim 2, wherein the second driving circuit performs second synchronous driving for synchronously driving the two or more scanning lines included in another scanning line group in accordance with the third cycle or the fourth cycle so as to be in synchronization with the first synchronous driving or in asynchronization with the first synchronous driving.

4. The cholesteric liquid crystal driving device according to Claim 2, wherein the second driving circuit performs second asynchronous driving for asynchronously driving the two or more scanning lines included in another scanning line group in accordance with the third cycle or the fourth cycle so as to be in synchronization with the first asynchronous driving or in asynchronization with the first asynchronous driving.

5. A cholesteric liquid crystal driving method comprising:
a detection step of detecting a first scanning line and a second scanning line, wherein, in image data having two or more gray levels to be displayed by a plurality of cholesteric

liquid crystals provided at intersections of a plurality of scanning lines and a plurality of data lines, the orientation of each of the plurality of cholesteric liquid crystals being defined in a P-orientation, an F-orientation, or an H-orientation in accordance with a voltage between the corresponding scanning lines and the corresponding data lines, one part of the image data corresponding to a cholesteric liquid crystal on the first scanning line has different gray levels other than a halftone and another part of the image data corresponding to a cholesteric liquid crystal on the second scanning line has the same gray level other than the halftone;

a first driving step of displaying, on the basis of a detection result for the first scanning line by the detection step, the one part of the image data to be displayed by the cholesteric liquid crystal on the first scanning line by driving the cholesteric liquid crystal on the first scanning line in accordance with a first cycle including a reset period for resetting the cholesteric liquid crystal in the H-orientation, a selection period for selecting the cholesteric liquid crystal, which is reset in the H-orientation, in a TP orientation, and a holding period for holding the cholesteric liquid crystal, which is selected in the TP orientation, in the F-orientation and in accordance with a second cycle including a reset period for resetting the cholesteric liquid crystal in the H-orientation, a selection period for selecting the cholesteric liquid crystal, which is reset in the H-orientation, in the H-orientation, and a holding period for

holding the cholesteric liquid crystal, which is selected in the H-orientation, in the P-orientation; and

a second driving step of displaying, on the basis of a detection result for the second scanning line by the detection step, the other part of the image data to be displayed by the cholesteric liquid crystal on the second scanning line by driving the cholesteric liquid crystal on the second scanning line in accordance with a third cycle including a reset period for resetting the cholesteric liquid crystal in the H-orientation and a holding period for holding the cholesteric liquid crystal, which is reset in the H-orientation, in the F-orientation or in accordance with a fourth cycle including a reset period for resetting the cholesteric liquid crystal in the H-orientation, the cholesteric liquid crystal, which is reset in the H-orientation, being transit to the TP orientation at the end of the reset period.

6. The cholesteric liquid crystal driving method according to Claim 5, wherein:

the detection step detects at least one scanning line group including two or more scanning lines, each of the scanning lines corresponding to the second scanning line; and

the second driving step performs first synchronous driving for synchronously driving the two or more scanning lines included in the one scanning line group in accordance with the third cycle or the fourth cycle or performs first asynchronous driving for asynchronously driving the two or more scanning lines included in the one scanning line group in accordance

with the third cycle or the fourth cycle.

7. The cholesteric liquid crystal driving method according to Claim 6, wherein the second driving step performs second
5 synchronous driving for synchronously driving the two or more scanning lines included in another scanning line group in accordance with the third cycle or the fourth cycle so as to be in synchronization with the first synchronous driving or in asynchronization with the first synchronous driving.

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8. The cholesteric liquid crystal driving method according to Claim 6, wherein the second driving step performs second
asynchronous driving for asynchronously driving the two or more scanning lines included in another scanning line group in
15 accordance with the third cycle or the fourth cycle so as to be in synchronization with the first asynchronous driving or in asynchronization with the first asynchronous driving.

AMENDED CLAIMS

[received by the International Bureau on 12 May 2005 (12.05.05);
original claims 1-8 replaced by amended claims 1-2]

1. A cholesteric liquid crystal driving device comprising:

a detection circuit for detecting a first scanning line

5 and a second scanning line, wherein, in image data having two
or more gray levels to be displayed by a plurality of

cholesteric liquid crystals provided at intersections of a
plurality of scanning lines and a plurality of data lines, the
orientation of each of the plurality of cholesteric liquid

10 crystals being defined in a P-orientation, an F-orientation,
or an H-orientation in accordance with a voltage between the
corresponding scanning lines and the corresponding data lines,

one part of the image data corresponding to a cholesteric
liquid crystal on the first scanning line has different gray

15 levels other than a halftone and another part of the image
data corresponding to a cholesteric liquid crystal on the
second scanning line has the same gray level other than the
halftone;

a first driving circuit for displaying, on the basis of a
20 detection result for the first scanning line by the detection
circuit, the one part of the image data to be displayed by the
cholesteric liquid crystal on each of a plurality of first

scanning lines by driving the cholesteric liquid crystal on
each of the plurality of first scanning lines in accordance

25 with a first cycle including a reset period for resetting the
cholesteric liquid crystal in the H-orientation, a selection
period for selecting the cholesteric liquid crystal, which is
reset in the H-orientation, in a TP orientation, and a holding

period for holding the cholesteric liquid crystal, which is selected in the TP orientation, in the F-orientation and in accordance with a second cycle including a reset period for resetting the cholesteric liquid crystal in the H-orientation, a selection period for selecting the cholesteric liquid crystal, which is reset in the H-orientation, in the H-orientation, and a holding period for holding the cholesteric liquid crystal, which is selected in the H-orientation, in the P-orientation and by sequentially selecting and driving the plurality of first scanning lines using a pipeline system such that the selection periods do not overlap with each other during each of the reset period, the selection period, and the holding period in the first and second cycles; and

a second driving circuit for displaying, on the basis of a detection result for the second scanning line by the detection circuit, the other part of the image data to be displayed by the cholesteric liquid crystal on each of a plurality of second scanning lines by driving the cholesteric liquid crystal on each of the plurality of second scanning lines in accordance with a third cycle including a reset period for resetting the cholesteric liquid crystal in the H-orientation and a holding period for holding the cholesteric liquid crystal, which is reset in the H-orientation, in the F-orientation or in accordance with a fourth cycle including a reset period for resetting the cholesteric liquid crystal in the H-orientation, the cholesteric liquid crystal, which is reset in the H-orientation, being transit to the TP orientation at the end of the reset period, and by

collectively selecting and driving the plurality of second scanning lines during each of the reset period and the holding period in the third and fourth cycles or by sequentially selecting and driving the plurality of second scanning lines by shifting by the selection period during each of the reset
5 period and the holding period in the third and fourth cycles.

2. A cholesteric liquid crystal driving method comprising:
a detection step of detecting a first scanning line and a
10 second scanning line, wherein, in image data having two or more gray levels to be displayed by a plurality of cholesteric liquid crystals provided at intersections of a plurality of scanning lines and a plurality of data lines, the orientation of each of the plurality of cholesteric liquid crystals being
15 defined in a P-orientation, an F-orientation, or an H-orientation in accordance with a voltage between the corresponding scanning lines and the corresponding data lines, one part of the image data corresponding to a cholesteric liquid crystal on the first scanning line has different gray
20 levels other than a halftone and another part of the image data corresponding to a cholesteric liquid crystal on the second scanning line has the same gray level other than the halftone;

a first driving step of displaying, on the basis of a
25 detection result for the first scanning line by the detection step, the one part of the image data to be displayed by the cholesteric liquid crystal on each of a plurality of first scanning lines by driving the cholesteric liquid crystal on

each of the plurality of first scanning lines in accordance with a first cycle including a reset period for resetting the cholesteric liquid crystal in the H-orientation, a selection period for selecting the cholesteric liquid crystal, which is
5 reset in the H-orientation, in a TP orientation, and a holding period for holding the cholesteric liquid crystal, which is selected in the TP orientation, in the F-orientation and in accordance with a second cycle including a reset period for resetting the cholesteric liquid crystal in the H-orientation,
10 a selection period for selecting the cholesteric liquid crystal, which is reset in the H-orientation, in the H-orientation, and a holding period for holding the cholesteric liquid crystal, which is selected in the H-orientation, in the P-orientation and by sequentially selecting and driving the
15 plurality of first scanning lines using a pipeline system such that the selection periods do not overlap with each other during each of the reset period, the selection period, and the holding period in the first and second cycles; and

a second driving step of displaying, on the basis of a
20 detection result for the second scanning line by the detection step, the other part of the image data to be displayed by the cholesteric liquid crystal on each of a plurality of second scanning lines by driving the cholesteric liquid crystal on each of the plurality of second scanning lines in accordance
25 with a third cycle including a reset period for resetting the cholesteric liquid crystal in the H-orientation and a holding period for holding the cholesteric liquid crystal, which is reset in the H-orientation, in the F-orientation or in

accordance with a fourth cycle including a reset period for resetting the cholesteric liquid crystal in the H-orientation, the cholesteric liquid crystal, which is reset in the H-orientation, being transit to the TP orientation at the end of the reset period, and by collectively selecting and driving the plurality of second scanning lines during each of the reset period and the holding period in the third and fourth cycles or by sequentially selecting and driving the plurality of second scanning lines by shifting by the selection period during each of the reset period and the holding period in the third and fourth cycles.